

SPECIFICATION

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[SCANNING METHOD BY USING SHEET FEED SCANNER]

Background of Invention

[0001] Field of the invention

[0002] The present invention relates to a scanning method by using a sheet feed scanner. More specifically, the present invention relates to a scanning method with improved resolution by using a sheet feed scanner.

[0003] Description of the related art

[0004] As the operation performance of computers increases, and the Internet and multimedia are widely used, more image input devices such as digital cameras and optical scanners are increasingly required. Different from digital cameras that directly output the digital data of the image, the optical scanners have to transform analog data of the image into digital signals before the data is transmitted to the computer. According to the input of the document image, the optical scanners can be divided into pocket scanners, sheet feed scanners, drum scanners, and flatbed scanners. A sheet feed scanner manufactured by contemporary technology has 600 dpi of optical resolution with a contact image sensor (CIS).

[0005]

Fig. 1, is a schematic view of a conventional sheet feed scanner. The sheet feed scanner 100 includes a sheet feeder 110, and a scan module 130. The sheet feed scanner 110 serves to convey a paper sheet 150. The scan module 130 scans the sheet paper 150 conveyed from the sheet feeder 110. The sheet feeder 110 includes a conveying guide 112, a plurality of rollers 114 and a scanning window 116. The sheet paper 150 is conveyed along the conveying guide 112. The rollers 114 are arranged on the conveying guide 112, with two of the rollers 114 rolling in contact with each

other so that the paper sheet 150 can be transmitted by the rollers to pass between the two rollers 114 and go forward. When a motor (not shown) drives the rollers 114 to rotate, the rollers 114 convey the paper sheet 150 in a moving direction 120. An axis 115 of each of the rollers 114 is perpendicular to the moving direction 120 of the paper sheet 150. Furthermore, a scanning window 116 is arranged under the sheet feeder 110. The scanning module 130 includes a stationary scanning head 132 that is fixed in the scan module 130. The stationary scanning head 132 scans the paper sheet 150, which is conveyed from the sheet feeder 110, through the scanning window 116 of the sheet feeder 110.

[0006] In the above sheet feed scanner 100, the stationary scanning head 132 scans the paper sheet 150 when the paper sheet 150 is located above the scanning window 116. The scan resolution is determined on moving the paper sheet 150 by the motor and the rollers 114. The scan resolution thus obtained by such a sheet feeder 100 is low.

Summary of Invention

[0007] It is one object of the present invention to provide a scanning method using a sheet feed scanner, in which the scanning resolution can be greatly increased.

[0008] In order to achieve the above and other objectives of the present invention, a scanning method using a paper feed scanner is provided. The paper feed scanner comprises a sheet feeder attached thereon, a scanning head and a transmission mechanism, with the transmission mechanism driving the scanning head to scan a paper sheet fed from the sheet feeder into a scanning window. The method comprises: a) making the paper sheet go forward a first distance; b) the scanning head scanning a portion of the paper sheet; c) the transmission mechanism driving the scanning head to move a second distance in a first direction, wherein the second distance is smaller than the first distance; d) repeating the steps b) and c), until the scanning head completely scans a plurality of portions of the paper sheet in the scanning region; and e) repeating the steps a), b), c) and d), except that the scanning head moves in a second direction opposite to the first, until the scanning head completely scans all portions of the paper sheet to be scanned.

[0009] The sheet feeder comprises a conveying guide, and a plurality of rollers arranged

on the conveying guide and in contact with each other to make a pair of rollers, and wherein the paper sheet is transmitted along the conveying guide by rotating the pair of rollers.

- [0010] The sheet feeder further comprises a scanning window through which the scanning head scans the paper sheet. The length of the scanning window in the moving direction of the paper is larger than or equal to the first distance.
- [0011] The scanning head moves back and forth to scan the paper sheet. Alternately, the scanning head can move in one way to scan the paper sheet. In view of the foregoing, in the scanning method of the present invention, the scanning resolution obtained by moving the scanning head can be controlled more precisely than that obtained by moving the paper sheet. Therefore, the whole scanning resolution can be greatly improved.

Brief Description of Drawings

- [0012] It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.
- [0013] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principle of the invention. In the drawings,
- [0014] Fig. 1 is a schematic, cross-sectional view of a conventional sheet feed scanner;
- [0015] Fig. 2 is a schematic cross-sectional view of a sheet feed scanner according to one embodiment of the present invention; and
- [0016] Fig. 3 is a schematic view showing the improvement of the sheet feed scanner during the sheet feed scanner operation.

Detailed Description

- [0017] Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. Whenever

possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[0018] Fig. 2 is a schematic cross-sectional view of a sheet feed scanner according to one embodiment of the present invention. The sheet feed scanner 200 includes a sheet feeder 210 and a scan module 230. The sheet feed scanner 210 serves to convey a paper sheet 250. The scan module 230 scans the sheet paper 250 conveyed from the sheet feeder 210. The sheet feeder 210 includes a conveying guide 212, a plurality of rollers 214 and a scanning window 216. The sheet paper 250 is conveyed along the conveying guide 212. The rollers 214 are arranged on the conveying guide 212, with two of the rollers 214 rolling in contact with each other so that the paper sheet 250 can be transmitted by the pair of the rollers to pass between the two rollers 214 and go forward. When a motor (not shown) drives the rollers 214 to rotate, the rollers 214 convey the paper sheet 250 in a moving direction 220. An axis 215 of each of the rollers 214 is perpendicular to the moving direction 220 of the paper sheet 250. Furthermore, a scanning window 216 is arranged under the sheet feeder 210. The scanning module 230 includes a stationary scanning head 232, and a transmission mechanism 234. The transmission mechanism 234 drives the scanning head 232 back and forth to positions where it scans the paper sheet 250 conveyed by the sheet feeder 210, through the scanning window 216 of the sheet feeder 210. The transmission mechanism 234 consists of a gear set (not shown) and a stepping motor (not shown). The scanning head 232 goes forward step by step by the use of the gear set and the stepping motor of the transmission mechanism 234. The transmission mechanism 234 and the stepping motor are well known in the art and thus the detailed description thereof can be omitted.

[0019] Fig. 3 is a schematic view illustrating the scanning operation of the sheet feed scanner according to one embodiment of the present invention. In the conventional scanner, a scanning resolution is obtained after the paper sheet is sent to the scanning region by the stepping motor and the rollers 214. However, with the aid of moving the scanning head 232 as illustrated in the present invention, the scanning resolution can be greatly enhanced. With reference to Figs. 2 and 3, the paper sheet 250 is placed into the sheet feeder 210. By the control of the stepping motor and the rollers 214, the paper sheet 250 travels forward a first distance D in the moving

direction, and then stops. After the paper sheet 250 stops, a scanning region 260 of the paper sheet 250 is exposed through the scanning window 216. In this embodiment, a center of the scanning head 232 is located at a first position 272 which faces the scanning region 260. After the paper sheet 250 stops, the scanning head 232 scans a corresponding portion of the paper sheet accessible from the first position 272, then the center of the scanning head 232 travels a second distance S from the first position 272 to a second position 274 in the first scanning direction 282. The first distance D is larger than the second distance S . After the scanning head 232 stops, the scanning head 232 scans a corresponding portion of paper sheet accessible from the second position 274. The scanning head 232 then travels a second distance S in the first scanning direction 282, and moves to a third position 276. After the scanning head 232 stops at the third position, the scanning head 232 scans a corresponding portion of the paper sheet 250 accessible from the third position 276. The scanning head 232 then travels a second distance S in the first scanning direction 282, and moves to a fourth position 278. Similarly, after the scanning head stops, the scanning head 232 scans a corresponding portion of the paper sheet 250 accessible from the fourth position 278. It should be noted that an area where the scanning head 232 scans from the first position 272 to the fourth position 278 is smaller than that of the scanning region 260. Furthermore, the scanning window 216 is designed such that a length of the scanning window 216 in the direction 220 of the paper sheet 250 is larger than or equal to the distance D .

[0020]

The paper sheet 250 further moves a first distance D in the direction 220, and then stops. The scanned portion of the paper sheet 250 leaves the scanning window 216, and then a non-scanned portion of the paper sheet 250 goes to be located in the scanning region 260, while the center of the scanning head 232 is located at the fourth position 278. After the paper sheet 250 stops, the scanning head 232 scans a corresponding portion of the paper sheet 250 accessible from the fourth position 278. The scanning head 232 then travels a second distance S to the third position 276 in the second scanning direction 284. After the scanning head 232 stops, the scanning head 232 scans a corresponding portion of the paper sheet 250 accessible from the third position 276. The scanning head 232 further travels a second distance S to the second position 274 in the second scanning direction 284. After the scanning head

232 stops, the scanning head 232 scans a corresponding portion of the paper sheet 250 accessible from the second position 274. The scanning head 232 further moves to the first position 272 in the second moving direction 284 with a second distance S , and scans a corresponding portion of the paper sheet 250 accessible from the first position 272. The scanner 200 repeats the above steps until the whole paper sheet 250 is scanned.

[0021] In the scanning method by using the sheet feed scanner according to the present invention, the scanning resolution of paper sheet 250 can be greatly increased by moving the scanning head 232.

[0022] In the preferred embodiment of the present invention, after the paper sheet goes forward a first distance, the scanning head scans the paper sheet at four positions, i.e., the first position, the second position, the third position, and the fourth position. The four positions are equally spaced from each other. However, the invention is not limited to four positions, any number of the positions can be used.

[0023] The scanner of the present invention scans the paper sheet in two directions. One-way scanning can also be applied to the present invention. With reference to Fig. 2 and Fig. 3, the scanning head 232 scans from the first position 272 to the fourth position 278, going forward a second distance S each time. After reaching the fourth position 278, the sheet feeder 210 transmits the paper sheet 250 forward a first distance D . The scanning head 272 moves back to the first position 272. After the paper sheet 250 moves a distance D , the scanning head 232 moves from the first position 272 by the second distance S step by step until it reaches the fourth position 278. The one-way scanning is repeated until the whole paper document is scanned.

[0024] In view of foregoing, in the scanning method of the present invention, the scanning resolution obtained by moving the scanning head can be controlled more precisely than that obtained by moving the paper sheet alone. Therefore, the whole scanning resolution can be greatly improved.

[0025] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that

the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

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